



# Sense and Respond Logistics: Co-Evolution of an Adaptive Enterprise Capability



Presented to:

## Change Management Group

23 October 2003

# Transforming Defense

...*The new American Way of War*

## *The New Rules*

- Fight first for information superiority
- Speed of command
- Access to information-shared awareness
- Dispersed forces-noncontiguous operations
- Demassification
- Elimination of process lines  
(e.g. organize, deploy, employ, sustain; ops, intel, logistics)
- Elimination of structural lines  
(e.g. Joint ops at the small unit level)
- Dynamic self-synchronization
- Alter initial conditions
- Develop high rates of change
- Compression of levels of war

## NETWORK CENTRIC WARFARE

HIGH RATES OF  
CHANGE

CLOSELY COUPLED  
EVENTS

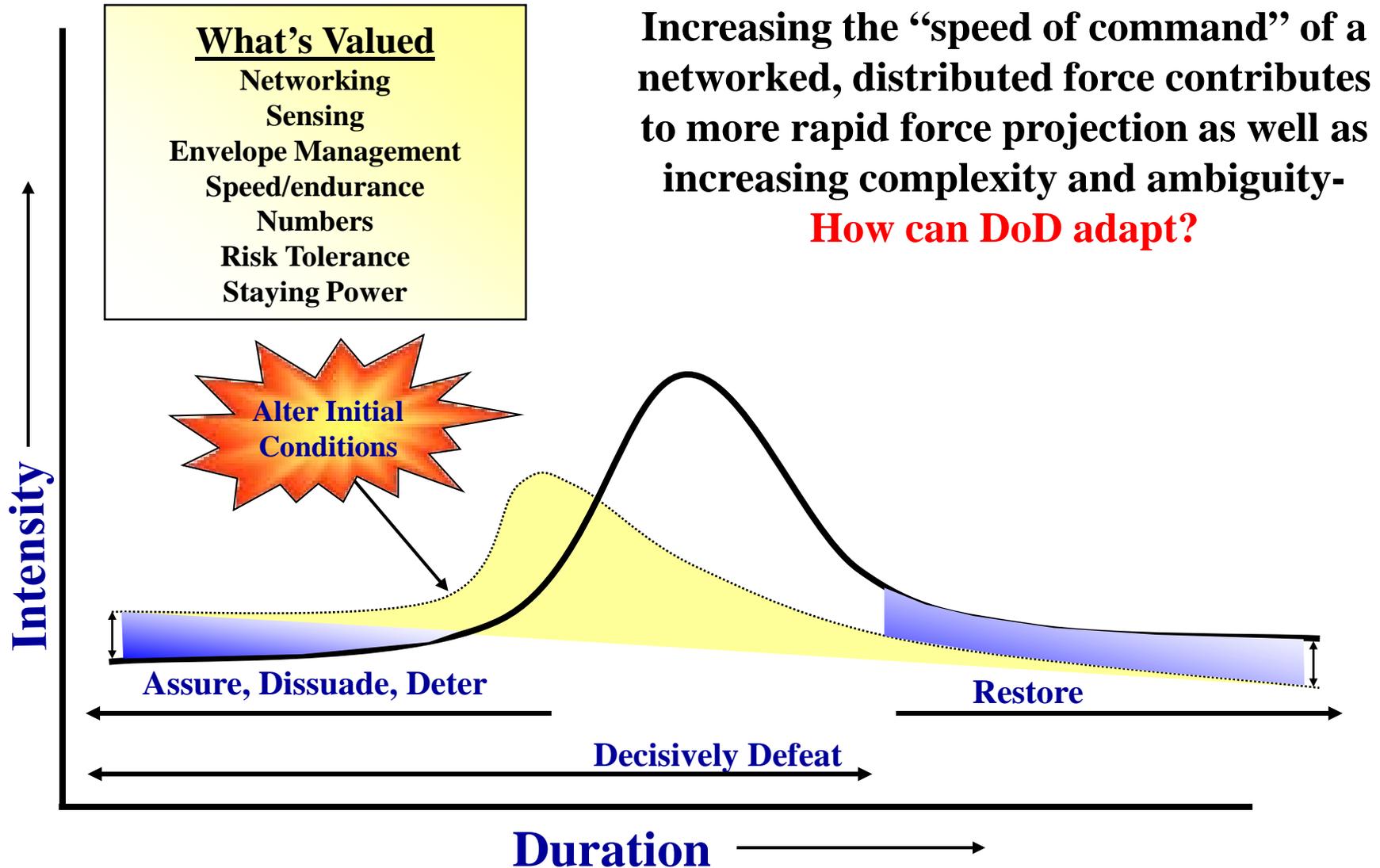
LOCK IN/OUT

SPEED OF COMMAND

SELF-  
SYNCHRONIZATION

# Transforming Defense

*...deter forward ...or defeat with modest reinforcement*



# Approaches to Logistics

## Mass-Based



- More is better
- Mountains of stuff measured in days of supply
- Uses massive inventory to hedge against uncertainty in demand and supply
- Mass begets mass and slows everything down

Prime Metric:  
Days of Supply

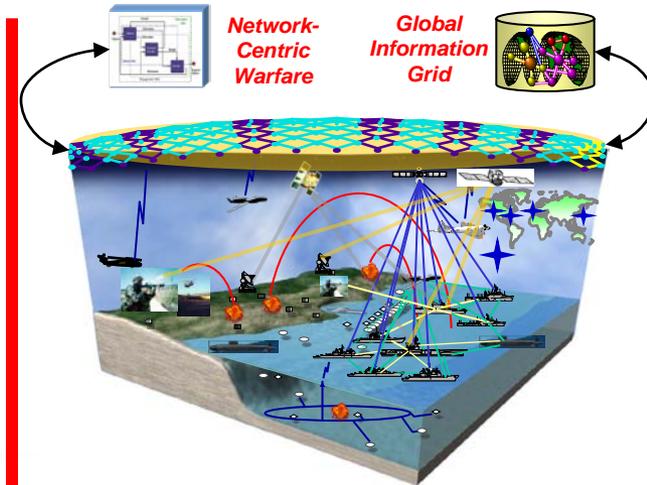
## Just-in-Time



- On-time is better
- Inventory is reduced to a minimum and kept moving
- Uses precise demand prediction and static optimization to purge uncertainty
- Works great, except when it doesn't

Prime Metric:  
Flow Time

## Sense and Respond



- Adaptive is better
- Inventory is dynamically positioned throughout
- Uses transportation flexibility and robust IT to handle uncertainty
- Initial S&R models look promising
- Supports distributed, adaptive ops

Prime Metric:  
Speed/Quality of Effects

# What's the Behavior Telling Us?

**Current Logistics Concepts**  
(Predominant Approach)

**Sense & Respond Logistics**  
(Predominant Approach)

**“Predictive, optimized, linear supply chain”**

**“Adaptive, responsive demand networks”**

Army Stuff

Navy Stuff

USAF Stuff

USMC Stuff

Common  
Stuff

Other Stuff

Sources of Stuff  
(Theater, CONUS, etc)

**“Traditional C  
2”**

Forward Ops

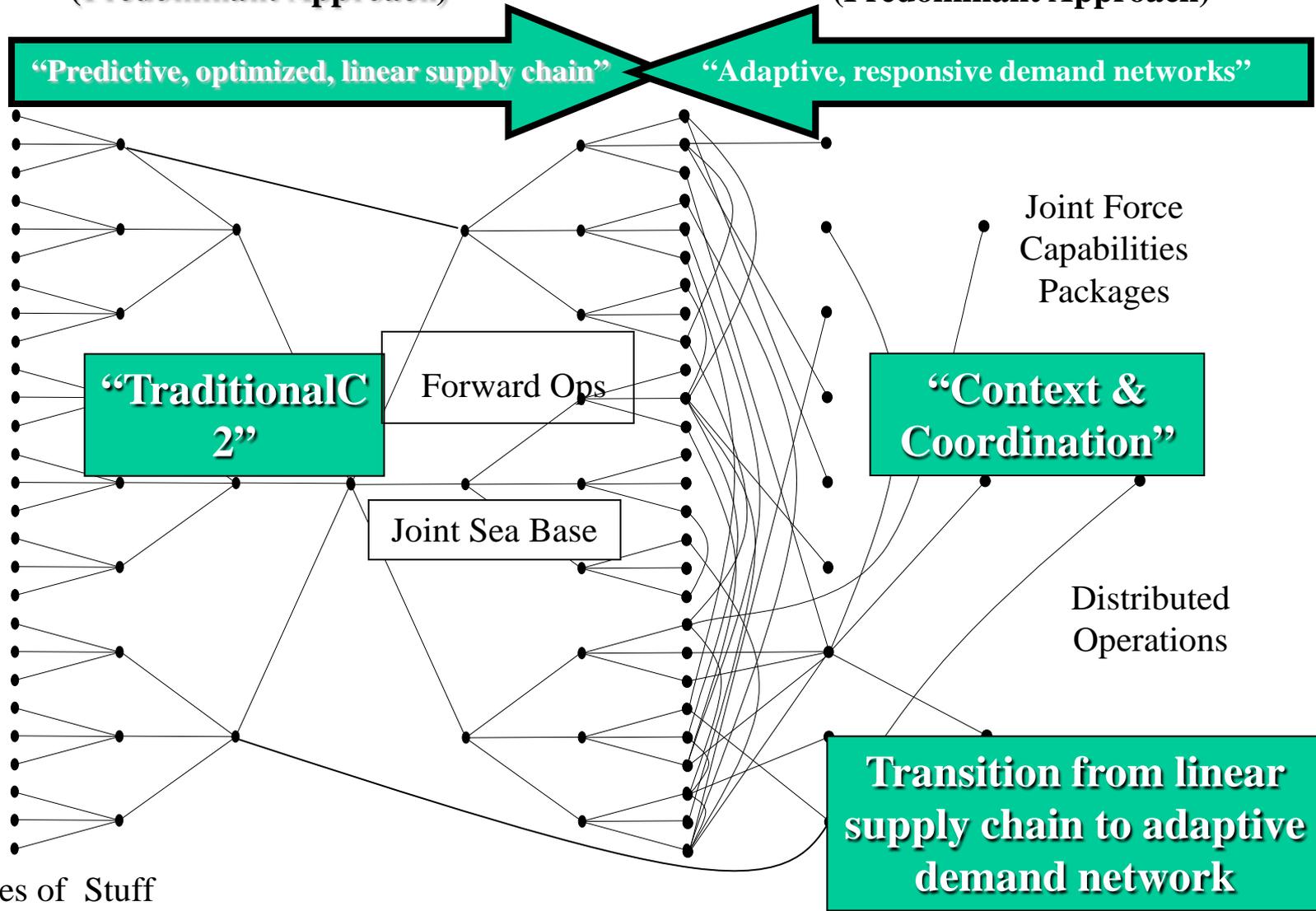
Joint Sea Base

Joint Force  
Capabilities  
Packages

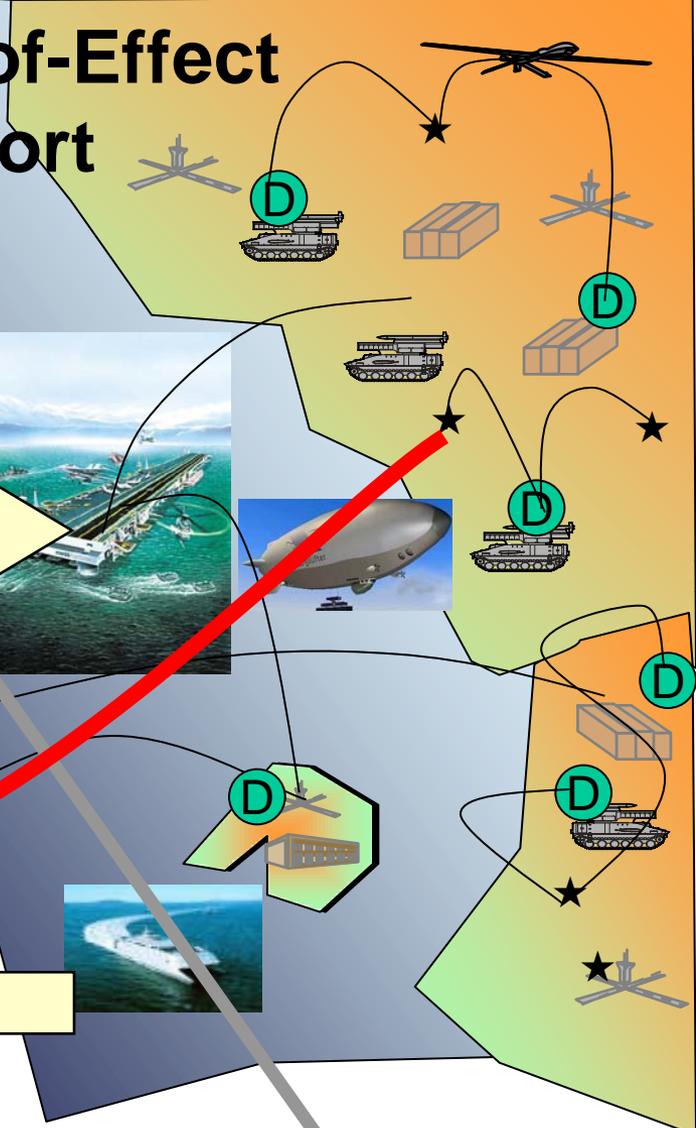
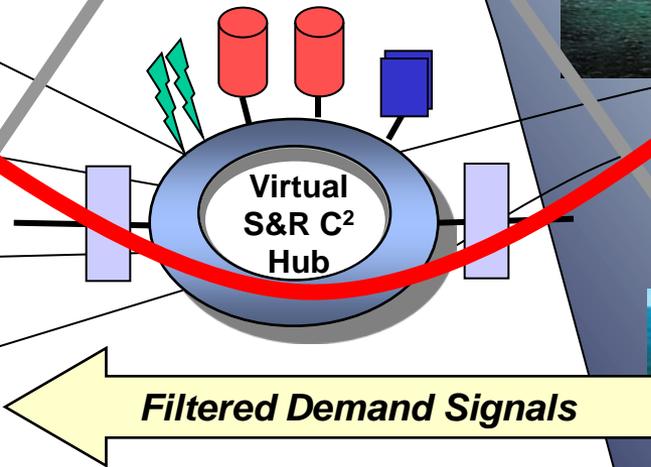
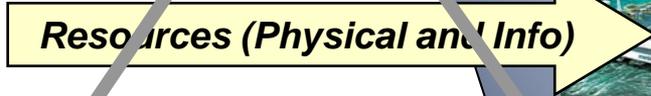
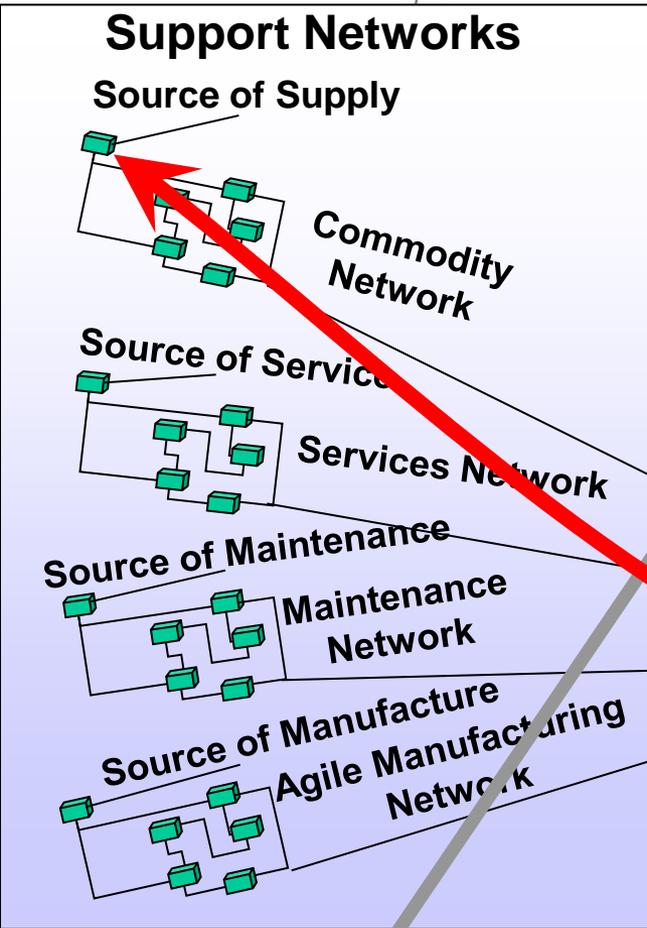
**“Context &  
Coordination”**

Distributed  
Operations

**Transition from linear  
supply chain to adaptive  
demand network**



# End-to-End S&R Point-of-Effect to Source of Support



**Real-Time, Effects-Driven Demand and Support Networks**



**D Demand Node**  
**★ Effect Node**

# S&R Project Goals

- Catalyze transformation of a joint, adaptive logistics capability throughout DoD
- Develop a formal concept for S&R Logistics in the context of Joint Adaptive Operations
- Identify and document measures to evaluate potentially transformational logistics concepts
  - **Go beyond standard logistics flow measures to measures of survivability, agility, coherence, and speed/quality of effects**
- Incorporate a S&R logistics module into experimentation that allows DoD to gather operational data and evaluate the Sense and Respond concept; inform system design
  - **Create a prototype information system that supports logistics adaptation to changes in the operational environment**
  - **Use rapid prototyping and an experimentation campaign to capture learning and inform capability build**
  - **Allow opportunities for discovery and invention**

# S&R Project Approach

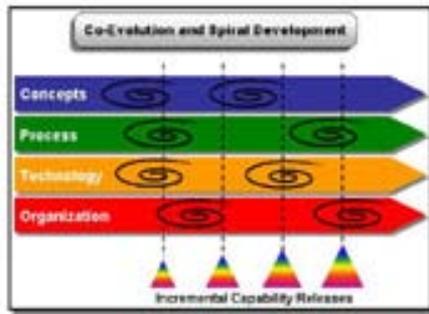
- Explore the behavioral aspects of networks and how they impact operational, organizational, process, and technology designs
- Operate networked teams synergistically across networked threads to achieve the desired outcome
  - Concept
  - Technical
  - Functional
  - Experimentation
- Leverage knowledge and technology from industry and academia
- Execute within operational context set by Joint Operations from the Sea Base
- Exploit full range of experimentation opportunities
- Evolve vs. “build” new capabilities
- Employ co-evolution strategy to influence change rapidly

# Co-Evolutionary Process

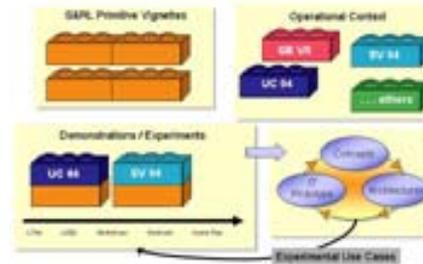
## Strategy and Concept



## Co-Evolution and Spiral Development



## S&R Experimentation Framework

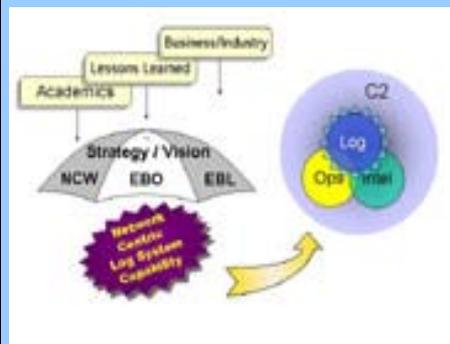


## Implications Across DoD and Beyond

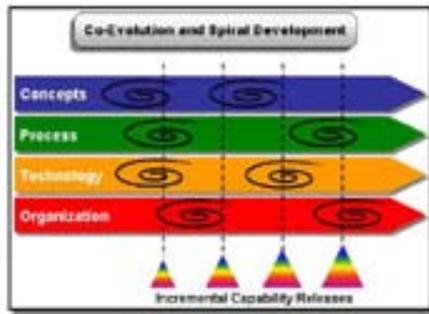


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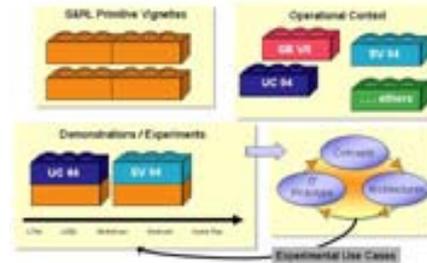
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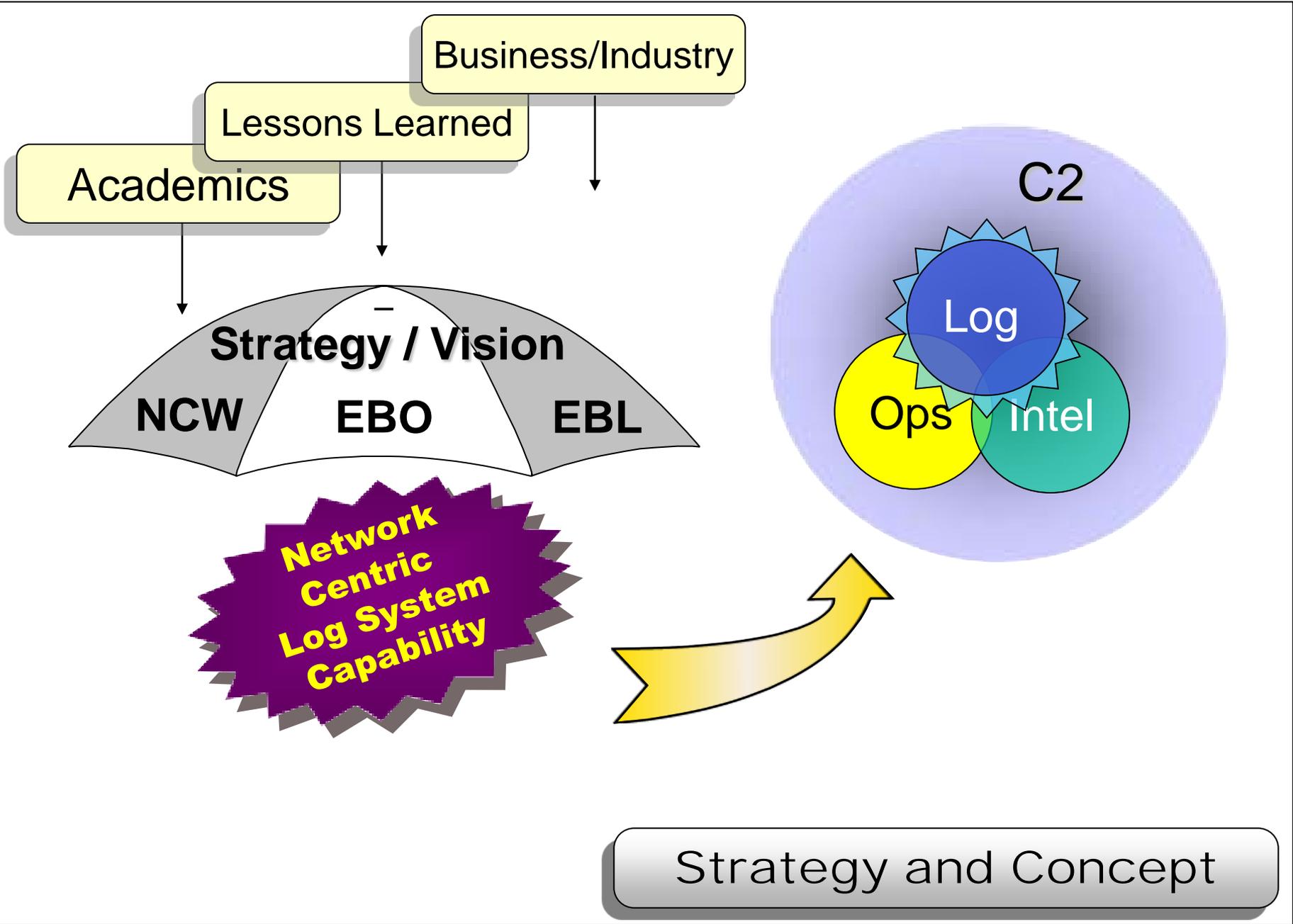


## S&R Experimentation Framework



## Implications Across DoD and Beyond







# S&R Concepts to Transform DoD

- S&R business analog is an adaptive managerial framework originally developed by IBM

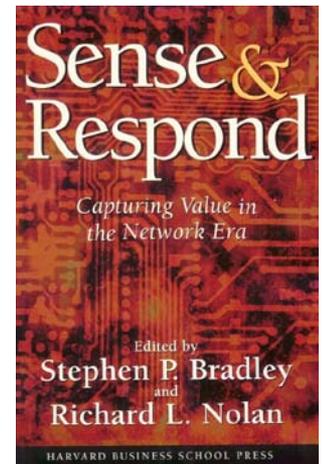
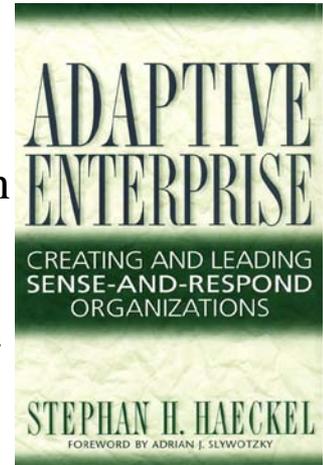
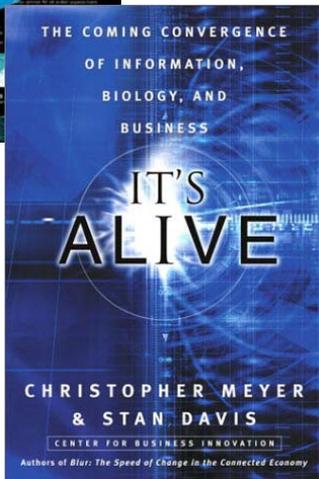
– **Key ideas:**

- Assume demand is ultimately unpredictable, so success depends on speed of pattern recognition and speed of response
- The best supply chain is no longer one that is highly optimized, but one that is highly flexible
- Organizes business units and subunits into “modular capabilities” that negotiate with one another over commitments
- Networks “self-synchronize” via a common environment and set of shared objectives; typically business financial and customer satisfaction measures
- Depends on sophisticated IT support to enable data sharing, “knowing earlier,” commitment tracking, and role reconfiguration

– **Business literature and practice reflect application of network centric theory and principles**



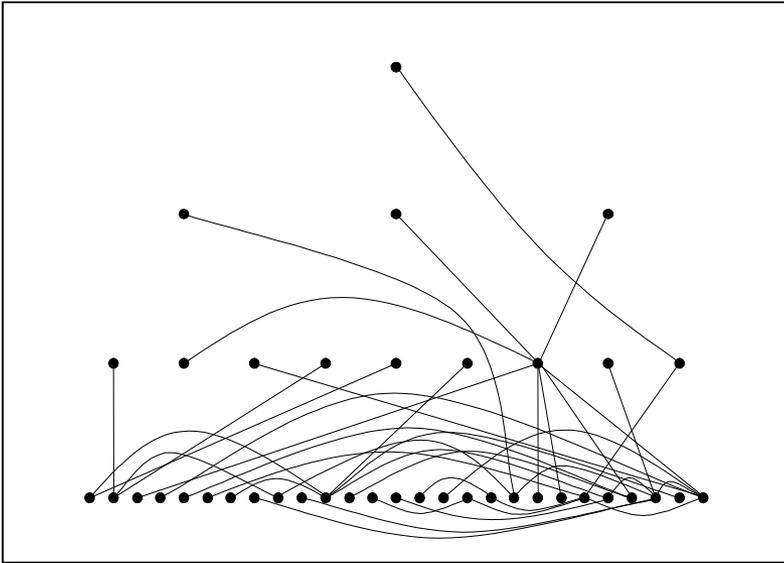
SWEDISH ARMED FORCES  
HEADQUARTERS



**NATO Integrated Event-Driven  
Rapid Deployment Force**



# Sense and Respond Logistics Concept



## Network

**Very robust, complex pattern,  
complex control, scale free**

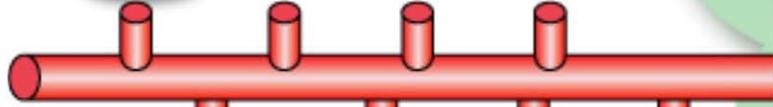
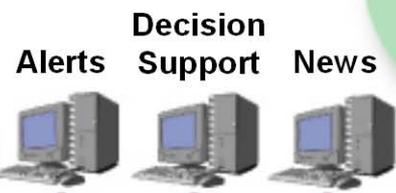
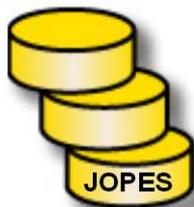
**'business end' best connected,  
natural to reconfigure or change flow**

- Support network is dynamic
  - **Support doctrine anticipates event-driven, reconfigurable support nets**
  - **Emphasizes distribution flexibility and support network responds to need**
- Negotiation-based relationships
  - **All entities use commander's intent, planned effects, and detailed situation awareness to negotiate and synchronize**
  - **Roles and commitments of entities are dynamically defined within a specific context**
  - **All entities are described in terms of current capabilities, not as static forces**
- Networks are robust and difficult to analyze and attack
  - **More robust to node failure**
  - **Adapts to real-time demand signals**
- Supports distributed, adaptive operations
  - **Network adaptivity allows logistics decisions to be made continuously and anticipatorily**
  - **Emphasis on information and distribution allows a greater degree of operational flexibility and risk management**
  - **No pause—log does not constrain ops speed**
  - **Mechanisms are transparent to warfighters; but results are very apparent**

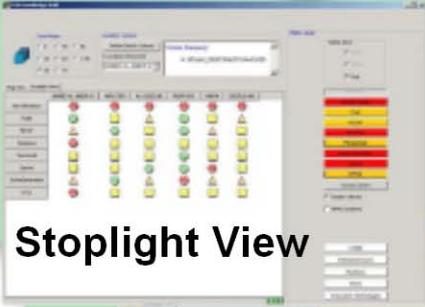
*S&RL is a source of operational advantage and a force multiplier*

# Sense & Respond Logistics Prototype Overview

Databases



Network Monitoring  
Metrics Analysis



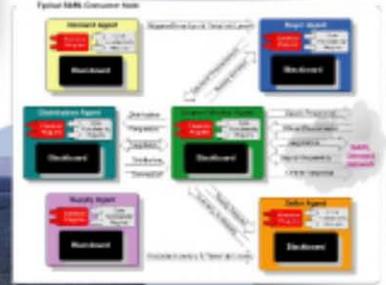
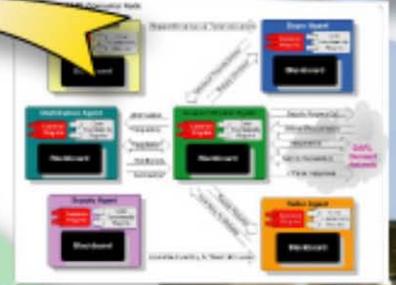
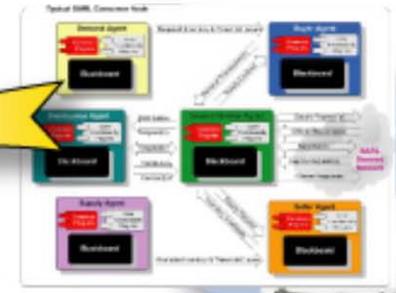
Stoplight View



Map View



Portal

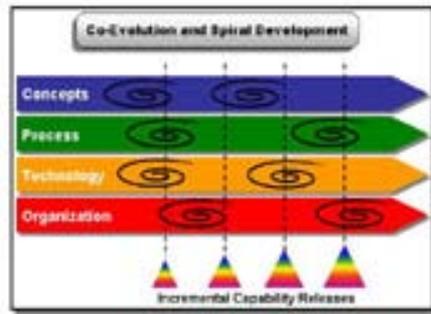


# Co-Evolutionary Process

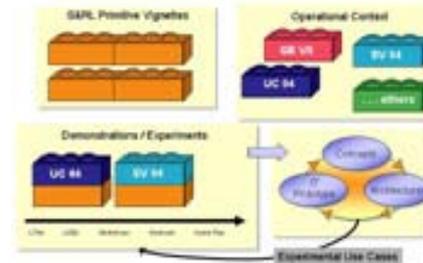
## Strategy and Concept



## Co-Evolution and Spiral Development



## S&R Experimentation Framework



## Implications Across DoD and Beyond



# Co-Evolution and Spiral Development

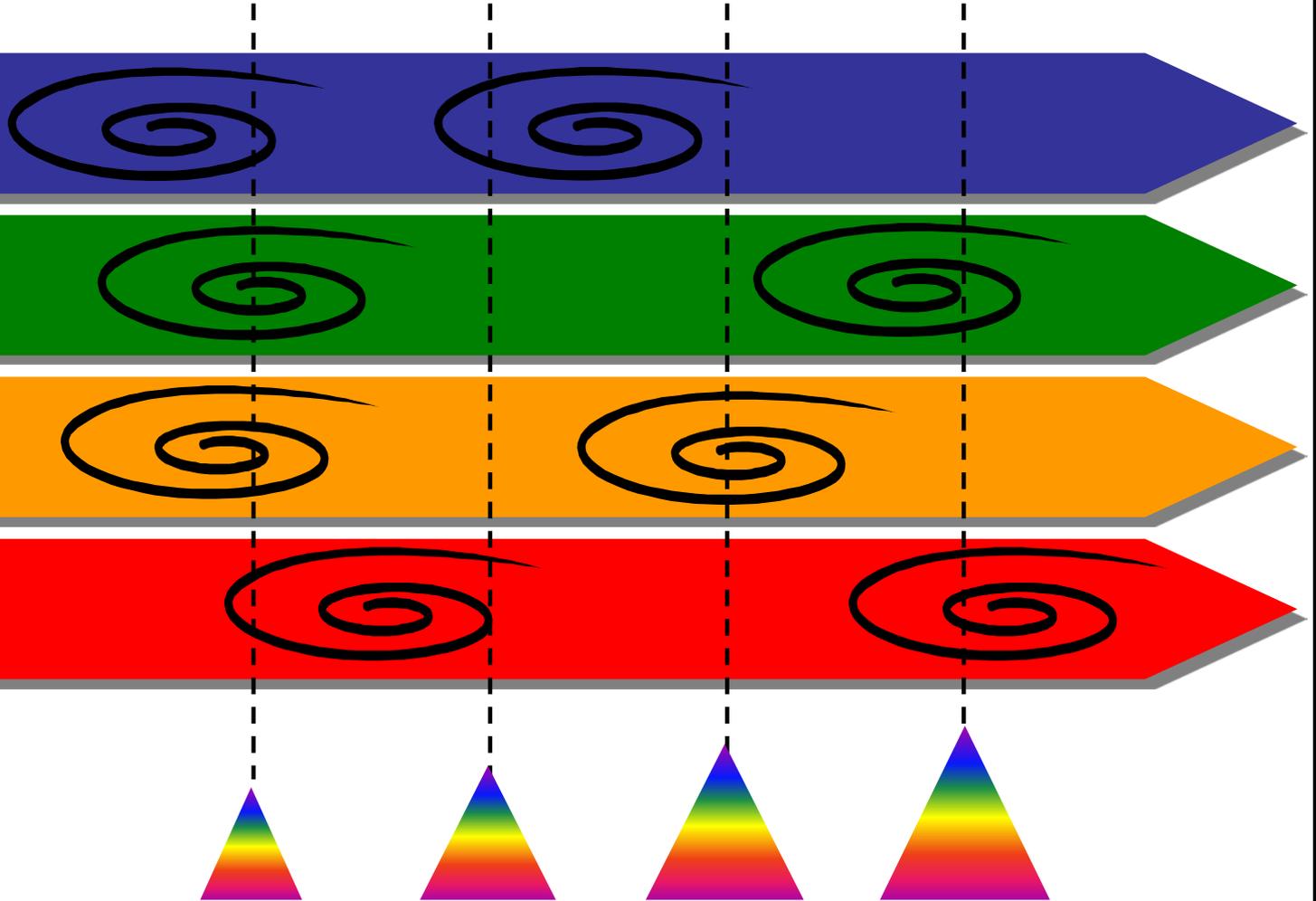
**Concepts**

**Process**

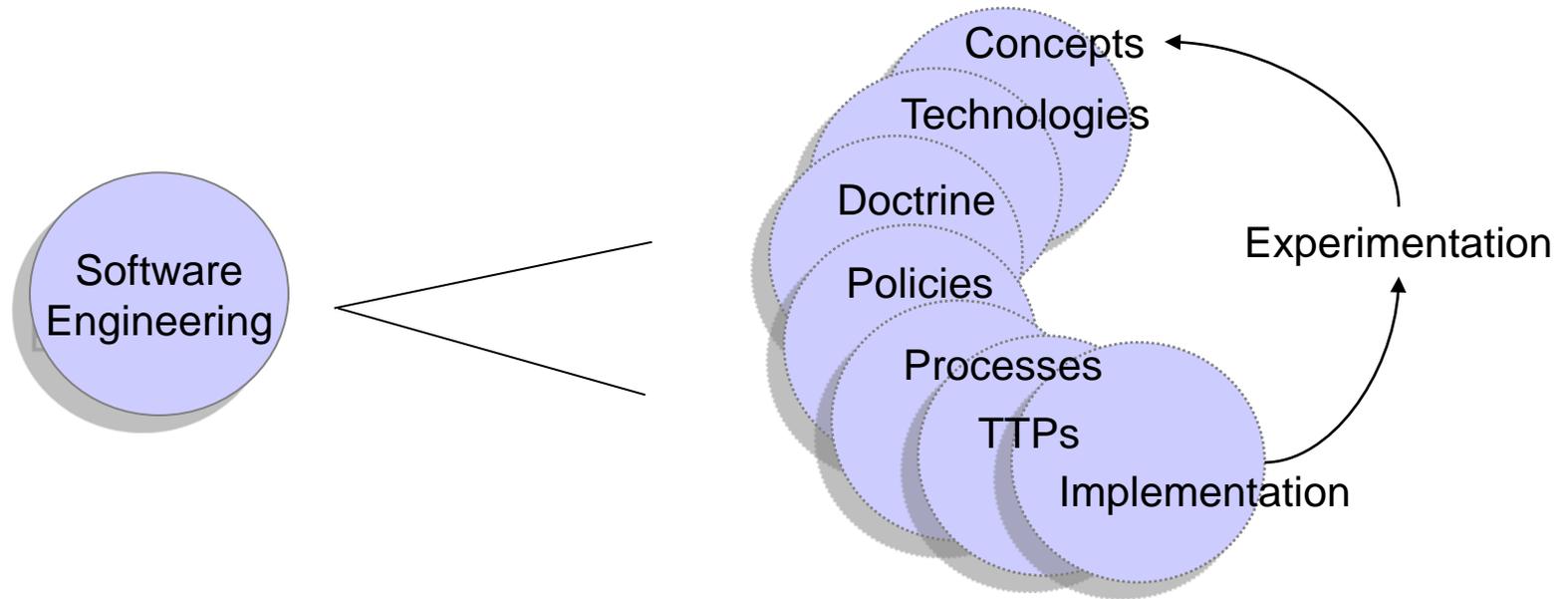
**Technology**

**Organization**

**Incremental Capability Releases**



# Spiral Development $\neq$ Co-Evolution



## Spiral Development Model

Focuses on **software development** processes characterized by cyclic, concurrent engineering

Cycles driven by **risk considerations**

**No feedback loop** into concepts, technologies, doctrine

## Co-Evolution Strategy

Focuses on **continuous implementation** of concepts, processes, policies, technologies, and organizations characterized by continuous assessment and feedback from the bottom up

Concurrent **concept and technology** development

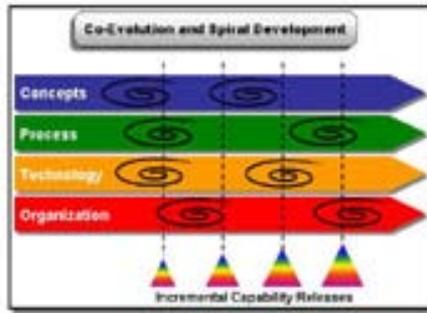
Cycles driven by **design experiments** that force co-evolution of concepts, technologies, doctrine at the domain intersections

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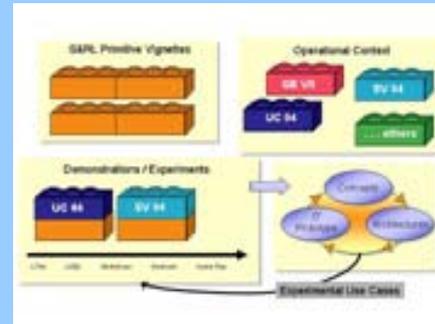
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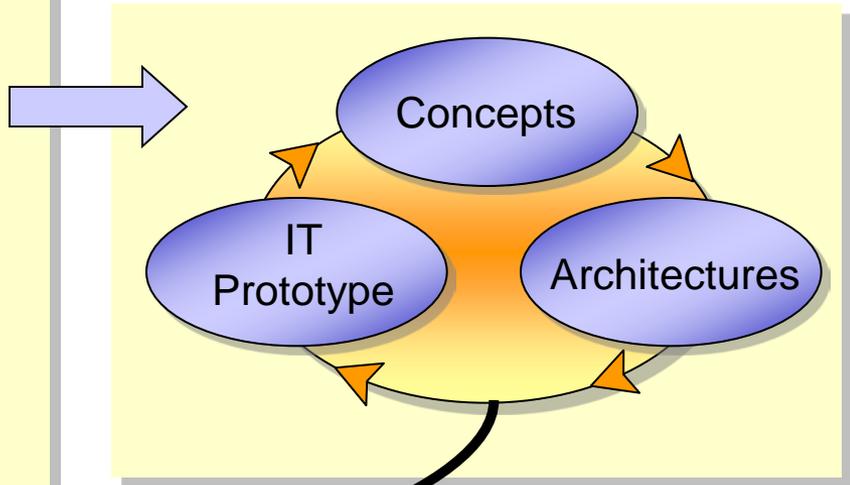
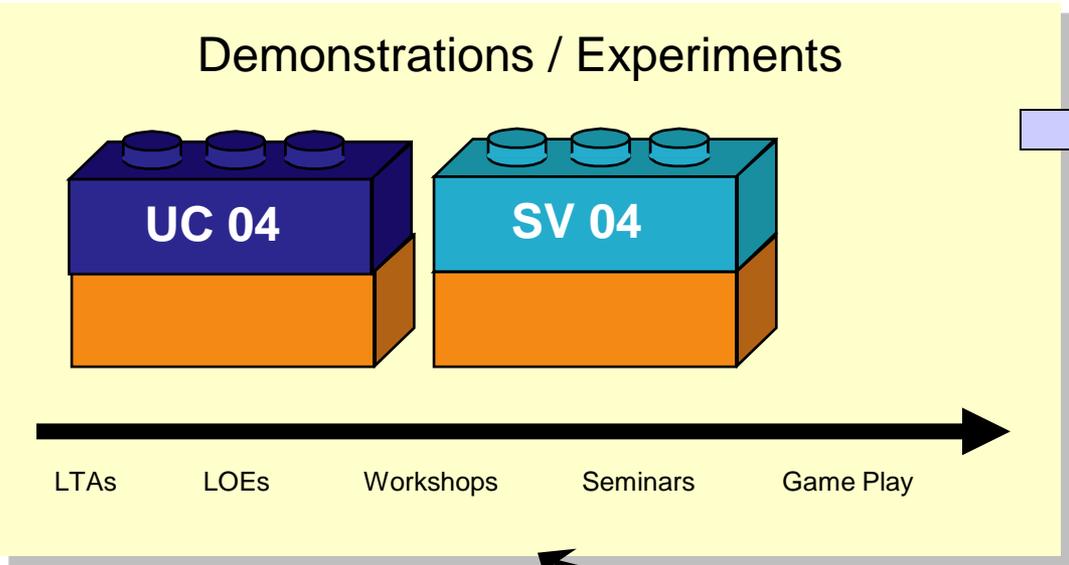
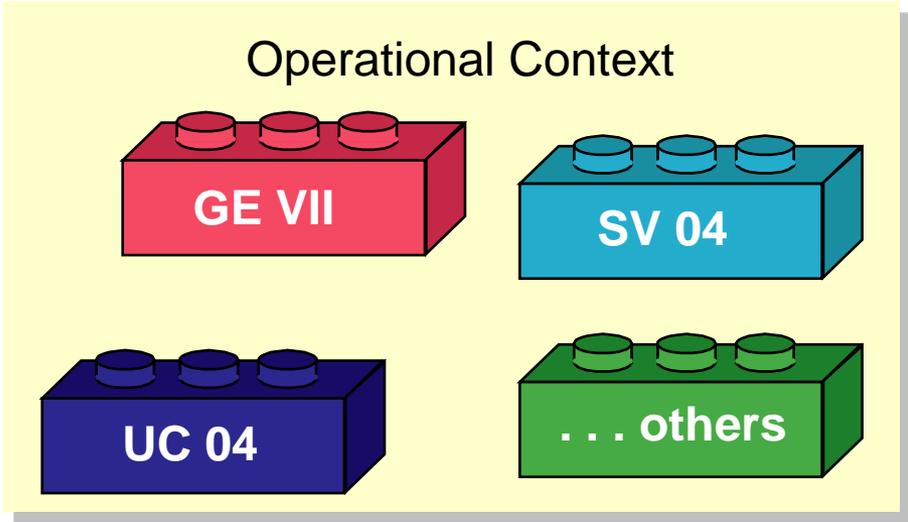
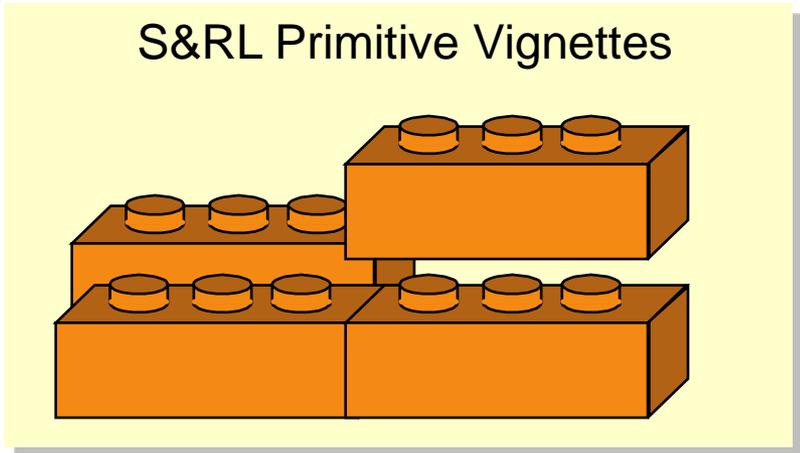
## S&R Experimentation Framework



## Implications Across DoD and Beyond



# S&R Experimental Framework



Experimental Use Cases

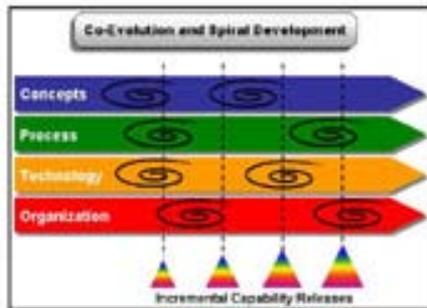


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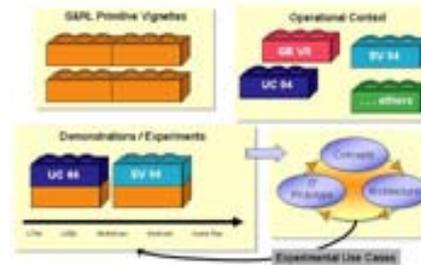
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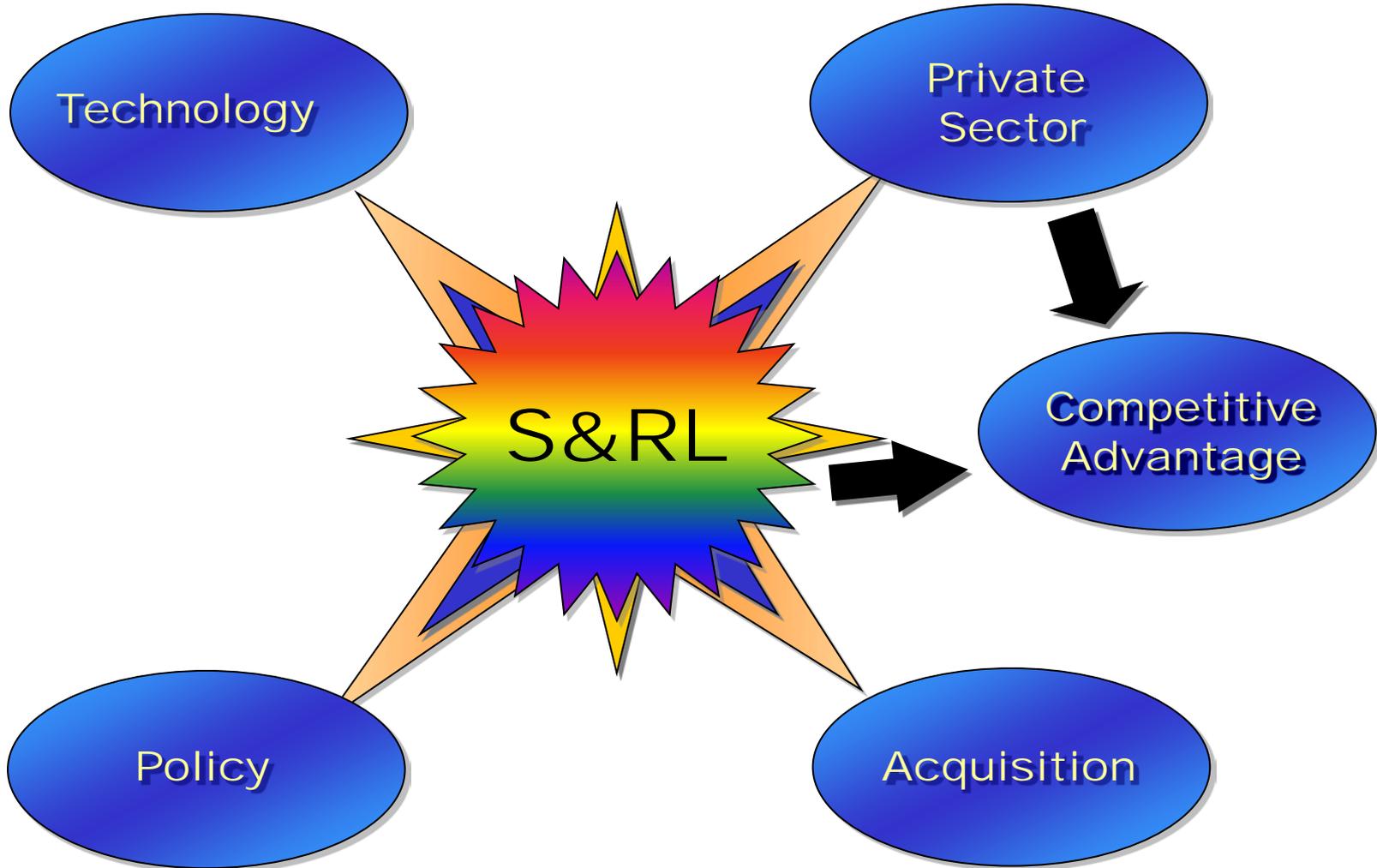
## S&R Experimentation Framework



## Implications Across DoD and Beyond



# Implications across DoD and Beyond



# Synchronizing S&R and the Force-Centric Logistics Enterprise

- **Overall Objective:** Develop a coherent, convergent DoD Logistics Transformation Strategy that reconciles and builds on S&RL, FLE, and PBL initiatives
- **Near-term:** Identify linkages and specific leverage points in programs and initiatives in these areas:
  - Concept
  - Process
  - Metrics
  - Experimentation
- Apply S&RL concepts and co-evolution strategies and processes, end-to-end and at all levels (strategic, operational, tactical—these blur in the S&R concept) to evaluate current and design future initiatives
- Present a concept for joint prototyping and experimentation to explore these interactions directly

# Linkages

- **Concept:** Apply NCW, EBO, and EBL (Effects Based Logistics) Concepts to Logistics Transformation
- **Metrics:** Emphasize customer-back approach:
  - **Primary Logistics objective:** Support to joint, adaptive, distributed operations effectiveness and capabilities; Secondary objective: Efficiency, cost and footprint reductions
  - Build on Balanced Scorecard concept to drive Logistics system behavior and design by adding a more comprehensive set of effects-based, operational metrics
  - Drive Supply Chains directly by military operational demand signals and increase supplier visibility over operational drivers to reduce risk and uncertainty and increase effectiveness
- **Process:** Link S&RL Operational process model directly to SCOR process model
- **Experimentation:** Bring suppliers into end-to-end prototype and experimentation plan, including SV04 and Joint Sea Basing, to explore dynamics and policies

# Emerging Insights: Achieving the Tipping Point

- Move *now* towards a joint, adaptive logistics capability based on the S&R concept
- Charter a joint effort to co-evolve a network-centric capability rapidly from the bottom up
- Lead disruptive change
  - Force cross-enterprise behavior
- Foster an innovative public-private partnership
  - Industry
  - Academia